

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 September 2003 (12.09.2003)

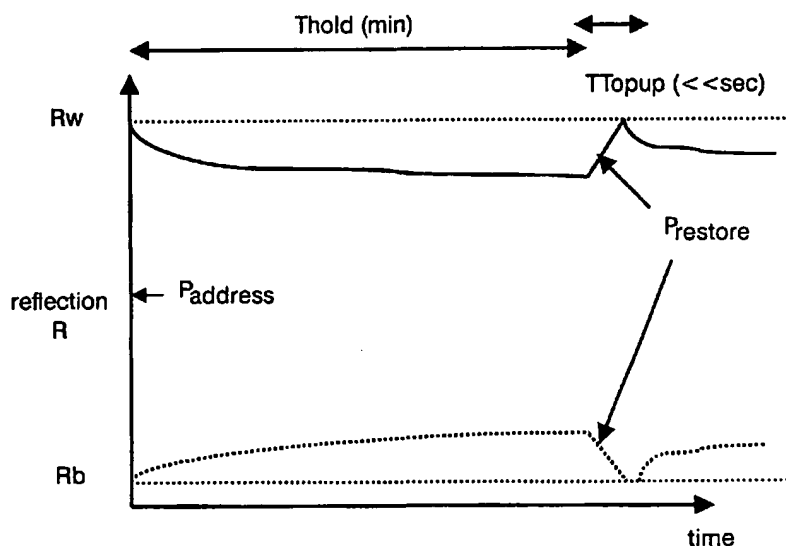
PCT

(10) International Publication Number
WO 03/075086 A3

- (51) International Patent Classification⁷: **G09G 3/34**, G02F 1/167
- (21) International Application Number: PCT/IB03/00512
- (22) International Filing Date: 12 February 2003 (12.02.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
02075846.2 5 March 2002 (05.03.2002) EP
- (71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **JOHNSON, Mark, T.** [GB/NL]; Prof . Holstlaan 6, NL-5656 AA Eindhoven (NL). **ZHOU, Guo-Fu** [NL/NL]; Prof . Holstlaan 6, NL-5656 AA Eindhoven (NL). **HENZEN, Alexander, V.** [NL/NL]; Prof . Holstlaan 6, NL-5656 AA Eindhoven (NL). **PITT, Michael, G.** [GB/NL]; Prof . Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (74) Agent: **DEGUELLE, Wilhelmus, H., G.**; Internationaal Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: ELECTROPHORETIC DISPLAY DEVICE AND DRIVING MEANS FOR RESTORING THE BRIGHTNESS LEVEL



(57) Abstract: An electrophoretic display device (1) comprising one pixel (10) with an electrophoretic medium (13), electrodes (6, 7), as well as drive means (4) by which the pixels can be brought into different optical states. Some time (thold) after the application of an addressing pulse (Paddress) for setting the brightness level (Rw, Rb) of a pixel (10), a restore pulse voltage (Prestore) is applied between the electrodes (6, 6', 7) for restoring the brightness level of a pixel to the set level (Rw, Rb). The restore pulse may be a set of consecutive pulses to bring the drifted brightness level even more smoothly (i.e. less perceivably) back to the original brightness level.

WO 03/075086 A3



(88) Date of publication of the international search report:
13 November 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/00512

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G09G3/34 G02F1/167

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G09G G02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, COMPENDEX, INSPEC, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01 91096 A (SEIKO EPSON CORP) 29 November 2001 (2001-11-29) - & US 2002/036616 A1 (INOUE SATOSHI) 28 March 2002 (2002-03-28)	1,3
A	paragraphs [0002], [0022], [0035], [0056] paragraphs [0061]-[0069]; figure 8 ---	2
A	KISHI E ET AL: "DEVELOPMENT OF IN-PLANE EPD" 2000 SID INTERNATIONAL SYMPOSIUM DIGEST OF TECHNICAL PAPERS. LONG BEACH, CA, MAY 16 - 18, 2000, SID INTERNATIONAL SYMPOSIUM DIGEST OF TECHNICAL PAPERS, SAN JOSE, CA: SID, US, vol. 31, May 2000 (2000-05), pages 24-27, XP001086658 cited in the application the whole document -----	1-3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

23 May 2003

Date of mailing of the international search report

21.08.03

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Wolfrum, G

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 03/00512

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-3

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-3

An electrophoretic display device comprising an applicator means applying, at a time after application of an addressing pulse for setting the brightness level of a pixel, a sequence of restore pulse voltages restoring the brightness level of said pixel.

2. Claims: 1,4-9

An electrophoretic display device comprising a temperature sensor which measures the ambient temperature and an applicator means applying, at a time after application of an addressing pulse for setting the brightness level of a pixel, a restore pulse voltage restoring the brightness level of said pixel, wherein the duration of time period between the addressing pulse and the restore pulse is dependent on the ambient temperature measured by the temperature sensor.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 03/00512

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0191096 A	29-11-2001	CN 1381034 T	20-11-2002
		EP 1286326 A1	26-02-2003
		WO 0191096 A1	29-11-2001
		US 2002036616 A1	28-03-2002
